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AGGRESSIVENESS AND PERFORMANCE IN A MINI-SYSTEM CONTEXT

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Lafayette, Indiana

February 1974

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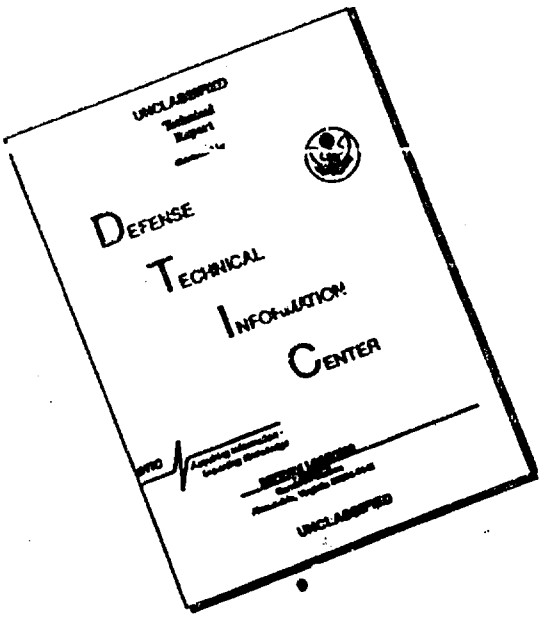

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Four experiments were conducted to test the hypothesis that aggressive disposition and/or past reinforcement for aggressive responses disrupts performance in stressful situations which require new learning. Four different human subject populations were used: pre-school children, college males, college football players, and teenage ghetto gang members. Several measures of aggressiveness were obtained and evaluated, and various performance tasks were tried. No strong evidence was obtained to support the original hypothesis. However, measures of "internal-external control expectancies" were found to correlate significantly with performance and, therefore, may be useful for predicting individuals' future performance in stressful situations.

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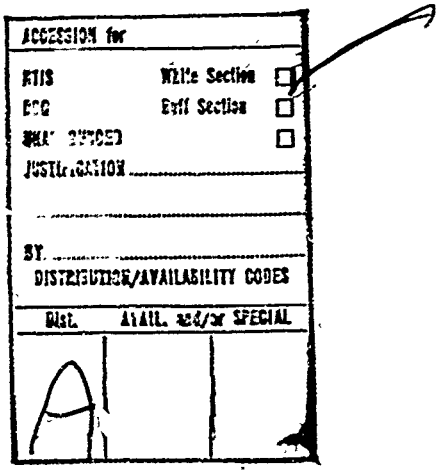

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PREFACE

An important goal of basic behavioral research within the military context is to uncover basic principles of behavior and to stimulate further research into the application of those principles. The following report describes an instance in which basic research at the U. S. Army Human Engineering Laboratory has been extended in order to explore its applicability to a more applied level.

Research on both rodents and primates had shown that individuals with histories of learned dominance or aggressive tendencies were poorer learners in highly stressful situations than subordinate individuals. The implications of these findings to the military are obvious if they apply to humans.

The reported experiments indicate that, if a relationship between aggression and learning under stress does exist at the human level, it is more complex than for subhumans. It is most noteworthy, however, that the first in this series of studies determined that "internal-external control expectancies" related significantly with performance under stress. Further research into the application of "expectancy" criteria to the selection of individuals who would be performing in stressful situations within the military could prove extremely valuable.

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AGGRESSIVENESS AND PERFORMANCE IN A MINI-SYSTEM CONTEXT

INTRODUCTION

The purpose of this project was to investigate the desirability of extending to human subjects previous research with infra-human subjects concerning the effect of aggressiveness on performance. Hudgens and MacNeil (1970) found that mice with a history of success in aggressive encounters perform less well on a stressful avoidance task than do mice with a history of failure. Similar findings with monkeys had been reported by Levine and Gordon (1968). These studies suggested that aggressive disposition and/or past reinforcement for aggressive responses may be disruptive of performance, at least in stressful situations which require some new learning or problem solving, among human subjects as well; and such a phenomenon would have obvious importance in military concerns regarding personnel selection, training, and assignment and in man-machine system engineering. However, little or no human data existed which could suggest the likelihood that human subjects do manifest such a phenomenon. This project was designed to provide such data.

Four studies were conducted. It was assumed that overt aggression is likely to be more frequent and also less complexly determined in young children than in adults, and therefore, that a study with young children was needed to provide a bridge between infrahuman and human adult findings; consequently, the first study dealt with young children. The second study employed college football players; the reason for using this population was that unlike most other adult populations, this group provided subjects for whom strong aggression responses might in fact be frequent and salient, and might therefore be more likely to disrupt other instrumental behavior. The third study employed "normal" college males. The fourth dealt with a teenage ghetto gang and another teenage ghetto population. All studies were aimed at investigating the relationship between aggression-proneness and performance on a learning task and at evaluating methodological problems and techniques for further such studies.

STUDY I

Subjects were 32 male children aged 39-68 months, in a day care center; all were of essentially lower-middle or middle class socioeconomic status. After extended pilot testing, a 7-item teacher rating scale was developed to provide the primary measure of individual differences in aggressiveness, and a 10-item peer-rating measure as a secondary measure (Parker, 1971]. The Stephens-Delys Reinforcement-Contingency Interview (SDRCI) (Stephens & Delys, 1973) was used to measure internal-external control (IE) expectancies (Rotter, 1966), another variable which would be expected to be related to performance on any instrumental learning task and which has been found (Crandall, 1971) related to aggressiveness in children. The SDRCI also provided a tertiary measure of aggression — not of overt aggression per se but of the subject's tendency to perceive aggression (his own or others') as important.

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A performance task was sought which would both share some properties with tasks used in the infrahuman research and also represent an analog of human adult performance situations — e.g., ultimately, military situations — in which excessive aggressive disposition might be disruptive. The task ultimately devised was a mirror-tracing task. The "design" traced was a single vertical pathway, 1/4 inches wide by 5-1/2 inches long. Pilot testing determined that children this age were unable to trace any more complex pattern, or even a diagonal or horizontal pathway. Ten trials were given. Dependent variables were time to traverse the pathway on each trial and number of errors, errors defined as leaving pathway, going backward, or lifting pencil.

An attempt was made also to experimentally manipulate aggressive disposition, as a complement to the measures of individual differences in aggression. The manipulation made use of aggression-modelling phenomena in children (e.g., Bandura, Ross, & Ross, 1963). Children were randomly assigned to an Aggression-Modelling (AM) condition or a Nonaggression-Modelling (NM) condition. In the AM condition the subject watched a 45 second videotape of a child (of approximately his own age) playing aggressively with an array of toys - "shooting" a gun, hitting a punching doll and jumping up and down on it, etc.; in the NM condition the videotape showed the child playing nonaggressively with the same array of toys. In each condition, the subject was told he would be allowed to play with these toys after doing the mirror-tracing task, which was given immediately after watching the videotape.

The results generally did not show any relation of aggression to performance, although IE was related to performance as predicted. Aggression-modelling conditions had no significant affect on performance, although on the time measure the trend ($F = 2.33$, $df = 1/28$, $p > .05$) was as expected, AM subjects requiring more time than NM subjects to complete the task; differences on the error measure were minimal ($F < 1.0$). Teacher ratings of aggressiveness (which had rater reliability of .81) also failed to be related to either the time or the error measure of performance. Peer ratings of aggressiveness seemed contaminated by a salience/conspicuousness factor: often a child named the same subject on both of two opposed questions (e.g., "Which boy are you most scared of?" and "Which boy are you not scared of?"). When only the citations on the aggression-oriented (as opposed to the nonaggression-oriented) questions were used, peer ratings correlated .63 with teacher ratings. There was, then, evidence of moderate validity of the teacher ratings of differences in aggressiveness and/or success in aggression. The SDRCI aggression index correlated only .30 ($p > .05$) with each of the rating measures, however; it seemed, then, not to reflect overt aggressive disposition but what might be termed an apparent concern with aggression. (In contrast with the findings regarding aggression, IE scores were significantly related to both performance and aggression measures. Dichotomizing subjects at the median on IE scores, boys with more "internal" scores made fewer errors ($F = 4.2$, $df = 1/28$, $p < .05$) and were faster ($F = 6.4$, $df = 1/28$, $p < .05$) than subjects with more "external" scores, and had higher ($p < .05$) scores on all three aggression measures.)

This study, then, provided little if any evidence that aggressiveness in humans disrupts performance on such a task. The teacher ratings appeared to be valid: indeed, there were a number of quite aggressive boys in the group and quite clear differences in subjects' usual success or failure in aggressive encounters. Still, these differences were not at all related to performance on this task. There were, however, a number of potentially mitigating factors. First, ethical considerations made it impossible to test subjects in really stressful conditions, and it may be only in such conditions that aggressive disposition disrupts performance. Second, of course, performance disruption attributable to aggression might appear on other tasks, although there is no apparent theoretical or empirical ground for suspecting any other specific type of task that would be expected to be as much or more susceptible to such disruption than this task. Third, the aggression-modelling condition seemed to produce little if any arousal or increase in aggressive "impulse," even though some of the specific behaviors modelled were indeed manifest by the subjects in their play following performance. Finally, IE may have obscured aggression effects.

That is, IE may indeed be a more direct and salient determinant of performance on an instrumental learning task than is aggressiveness; and since "internality" is related to both good performance and also aggression, it may have obscured the effect aggressiveness would have on performance in the absence of IE differences. These possibilities, then, suggest subsequent research that might be done to further seek disruptive effects of aggressiveness on performance in this population. Nonetheless, this study did not itself support confidence that human subjects would show the simple and straightforward performance disruption attributable to aggressive disposition that was manifest in the Hudgens-MacNeil and Levine-Gordon Studies.

STUDY II

Subjects were the 25 members of Purdue's freshman football squad. They were tested after spring practice in the spring of 1971.

Measures of aggressiveness were (a) peer ratings of five aggression-proneness variables: (1) temper; (2) "aggressiveness," "toughness," seeming always to be ready for a fight; (3) likelihood of winning a fight if ever he were in one; (4) "dominance;" and (5) vindictiveness; (b) self-ratings on each of these variables; (c) self-ratings on twelve other variables involving history or current behavior or feelings about aggression, fighting, dominance, and/or football; (d) coaches' ratings on several variables dealing with aggressiveness, attitude, ability and/or performance in football; and (e) the 16 PF personality inventory, which includes aggression-related variables among the 16 personality variables it purportedly measures. Coaches' ratings were completed jointly by two freshman coaches in collaboration; it was not possible to assess rater reliability nor the grounds for deciding on ratings in this instance because of limited cooperation of the coaches.

Performance tasks were (1) a six-point star mirror tracing task, giving ten trials with the preferred hand and using elapsed time and errors as performance criteria; and (2) the "labyrinth" task, a commercially produced toy requiring two-hand coordination in which performance is reflected in how many "errors" (holes in a board through which the marble may fall) can be missed before the first error is made, the performance criterion being, thus, number of errors missed.

Data were analyzed to answer three major kinds of questions and one subsidiary question. The major questions involved were (1) the convergent validity of the techniques for measuring differences in aggression-proneness (peer ratings, self-ratings, coach ratings, and inventory) and equivalences versus differences among the various aggression variables assessed in each; (2) the convergent validity of each of the performance criteria involved in the two tasks; and (3) the relation of aggression-proneness measures to performance measures, of interest both in itself and as reflecting on the construct validity of the measures. The fourth set of questions had to do with coaches' ratings of performance in <u>football</u> as a "real-world," non-laboratory index of performance under stress. This, it was hoped, would give evidence for validity of the laboratory-type tasks for assessing performance dispositions in naturalistic stress situations. Unfortunately, the coaches' performance ratings seemed heavily dependent on "ability" differences; and, with mininal cooperation from coaches in any case, the value of the football performance ratings was largely if not wholly vitiated.

Convergence and Equivalence of Aggression Measures and Variables

There was at least moderate agreement between peer and self ratings on all variables but (2), "aggressiveness." This is likely to be especially prone to social desirability pressure (to rate oneself high), and such pressure in all the variables is likely to have reduced the validity of self-ratings. "Dominance" was clearly separate from the other variables, but the others seemed so highly intercorrelated as to represent essentially the same variable. Consequently, in subsequent analyses self-ratings on all variables but "dominance" were summed to provide a single overall "aggressiveness" self-rating measure, and peer-ratings were similarly summed. These two variables correlated .44 ($p < .02$).

The summed peer ratings correlated fairly highly with coaches' ratings on variables such as "he has trouble losing his temper," "he doesn't perform nearly as well as he could," "he's overly dominant," "he's extremely aggressive," "he's unusually poised and cool" (negative correlation), and "he's probably never lost a fight in his life" (most r's > .45); the summed self-ratings agreed with the same coaches' ratings equally well, except for the coaches' ratings of "extremely aggressive" and "never lost a fight." Summed peer ratings correlated fairly well with 16 PF factors "tense-relaxed" (.58), "apprehensive-placid" (.53), "expedient-conscientious" (.43), and "shrewd-forthright" (.40). Surprisingly, however, summed self-ratings showed little correlation with 16 PF factor scores, even though both were self-report measures: the only 16PF variable significantly correlated with summed self-ratings was "more intelligent-less intelligent" ($r = .44$)! This most likely reflects the strong social desirability bias in the self ratings. Nonetheless, in general the four kinds of measures (self-ratings, peer ratings, coach ratings, and 16 PF scores) correlated fairly well with one another with the summed peer ratings showing most evidence of validity; and, with scattered exceptions, the various different "kinds" of aggressiveness tapped by separate questions in each measure seemed highly correlated, so that analyses of separate "aggressiveness" variables seemed not to be warranted. In subsequent analyses, the summed peer rating variable was used as the primary measure of aggressiveness.

Convergent Validity of Performance Criteria

The mirror tracing task provided both an elapsed time and a number-of-errors-made performance index on each trial. The labyrinth task provided only a number-of-errors-missed criterion. It seemed possible that differences in rate of learning would be manifest most clearly within the first trial or two, and that later asymptotic-level performance might reflect variables (e.g., motor coordination) not directly relevant to ability to learn and perform while adapting to stress; contrariwise, it also seemed possible that asymptotic-level performance differences might be the clearest, most stable, and therefore, most meaningful criteria. Consequently, for each of the two performance indices on the mirror tracing task and the one index on the labyrinth task, the subjects' score on (1) the first two trials alone, (2) the last two trials alone, and also (3) all 10 trials was recorded. These nine indices were then intercorrelated,.

It was apparent that the two tasks do not assess the same performance or ability variable: intercorrelations of the three indices on the labyrinth task with the six mirror task indices were zero order. Mirror task errors and time scores were highly correlated, except that error frequency on late trials was too low to provide a sensitive performance index. The best single criterion, in terms of convergence with other criteria, was elapsed time across all trials on the mirror task; the next best criterion was errors on the early mirror task trials. These were the performance variables used in subsequent analyses.

Aggressiveness and Performance

Summed peer ratings correlated only .18 (p = .19) with total elapsed time on the mirror tracing task and .19 (p = .19) with errors on early trials of the mirror task (and -.04 with errors on the labyrinth task). Summed self ratings correlated .13, .28 (p = .09), and -.19 (p = .18) with these variables. Several coach-rating variables correlated moderately with elapsed time on the mirror task, but many of these correlated opposite to expectation; four of the 16 PF variables correlated in the .20s with mirror time, but none higher. With errors on early trials of the mirror task only two coach rating variables correlated even in the .20s; five of the 16 PF variables correlated between .20 and .50. With errors on the labyrinth task, eight of the 15 coach-rating variables were correlated at least moderately, but again many opposite to expectation; and only one 16 PF variable correlated above .20.

Results

Overall, then, there was only very weak and nonsignificant support for the prediction of a correlation between aggressiveness and performance on these tasks in this sample. As in the first study, such a correlation might be more apparent on other tasks and/or in stressful performance conditions; but the coach ratings of performance in football were too heavily influenced by their judgments of "physical ability" to be useful as criteria of performance in stressful conditions.

STUDY III

Subjects were 44 members (male) of two separate undergraduate social fraternities at Purdue University. Fraternity groups were specifically chosen because of the need for subjects who would know each other sufficiently to provide peer ratings of aggressiveness as had been obtained in the football group. The same aggressiveness and performance tasks used in the previous study were administered, with the exceptions of the 16 PF personality inventory and the coach ratings.

The primary purpose of this study was to investigate the relation of aggressiveness to performance in a relatively "normal" human adult group and to investigate whether the results of the study with the football group would be generalized to such a population.

Convergence of Measures

As found in the football study, all of the five peer-rating items except "dominance" were highly intercorrelated (all r's > .56) with one another; so peer ratings on the four intercorrelated scales were summed to provide an overall aggressiveness scale. Curiously, however, self-ratings on these five items showed very little intercorrelation in this group. Even more curious, the summed peer ratings correlated .72 (p < .01) with summed self-ratings in one of the fraternity groups, but only .08 in the other. These findings cast additional question on the validity of self-ratings of aggressiveness; and subsequent analyses employed peer ratings as the measure of aggressiveness.

Aggressiveness and Performance

Labyrinth and mirror tracing task performance criteria were still generally uncorrelated. However, the summed peer ratings of aggressiveness were again correlated, although nonsignificantly, with total elapsed time on the mirror tracing task, as found in the football group; and peer ratings were also correlated significantly ($p < .05$) with errors on the final trials of the mirror tracing task. These correlations, as expected, reflected poorer performance associated with higher aggressiveness.

Results

Studies II and III combined, then, showed some weak but fairly consistent evidence that college males rated aggressive by their peers tend to do more poorly on a mirror tracing task then do subjects rated less aggressive. Performance on the labyrinth task showed no tendency to be related either to performance on the mirror tracing task or to measures of aggressiveness. Self-ratings of aggressiveness seemed to be subject to social desirability bias and to show inconsistent and unclear relations with other measures.

STUDY IV

Subjects were 34 black males ranging in age from 12 to 19 years. Of this group, 17 were members of an inner-city ghetto "gang" characterized by occasional episodes of extreme aggressiveness (ranging from intergang fights to an occasional homicide). The other 17 subjects were not members of any organized gang, but frequented the same neighborhood as the gang subjects and had some contact with the gang members. Subjects were matched in terms of age and education.

Primary interest in this study was to explore the feasibility of using in subsequent research a behavioral measure of aggression-proneness: a modification of the Buss (1961) "aggression machine." The same self- and peer-ratings as employed in Studies II and III were employed. In addition, the two gang leaders, who knew all subjects in both groups, completed ratings analogous to the coaches' ratings in Study II; and, in addition to ratings of each subject by his peers (i.e., members of his own group), each subject was rated also by members of the other group.

The "aggression machine" consisted of two panels, one for the subject and one for the experimenter. At the bottom of the subject's panel there were 10 buttons, with a light above each button. The buttons were numbered in ascending order to denote increasing intensities of electric shock presumably deliverable by each button. The experimenter's panel contained 10 lights corresponding to the subject's 10 buttons, as well as a timer connected to all buttons. By this means, the subject could be led to believe he was shocking another person (although no shocks were actually delivered), and the experimenter could ascertain how intense a shock the subject thought he was administering and for how long (intensity and duration).

The task given to each subject was to "teach" another subject (actually a tape recorder) who was in the next room a list of words, and to administer an electric shock for each error. The intensity and duration of shock administered in "teaching" a "subject" were taken as indices of overt aggression, as in a variety of previous studies concerning aggression.

The only "performance" measure taken was the subject's performance on the same task he thought he was teaching another subject (Williams [1972]). Half the subjects were and half were not instructed beforehand that they would be asked to learn the task themselves. Those who were instructed they would have to learn the task themselves were told they, too, would be administered electric shocks by another subject as an aid to their learning the task. This group, then, had not only more incentive for learning the task while administering it, but also more stress. Following their administering the task, all subjects were simply asked (without shock) as many of the items as possible. The task itself was an 11-item verbal paired-associates task. The stimulus in each case was the name of a man important in black history but not well known (e.g., "John M. Langston," "David Ruggles"); the correct response was his role in history (e.g., "Congressman from Virginia, 1889," "abolitionist, 1838"). All subjects had, through their "teaching" this task to another subject, gone through the list four times. After playing the role of teacher they were given the list themselves (without shocks) directly by the experimenter; the performance score was simply the number of correct responses.

Convergence of Aggression Measures

The summed peer ratings and summed ratings of subjects in the non-peer group did correlate significantly (.40, $p < .05$) with one another; but neither correlated with self-ratings or ratings by the gangleaders, nor did these two sets of ratings correlate significantly with one another.

Intensity and duration indices of aggression on the "aggression machine" were not significantly intercorrelated; and their correlations with rating measures showed no clear pattern. The correlations for intensity and duration, respectively, with ratings by the non-peer group were significant and negative (-.52 and -.54). with gang leaders' ratings, significant and positive (.51) for intensity but nonsignificant for duration (-.19); and with peer-group ratings (-.33 and .03) and self-ratings (-.21 and -.01) nonsignificant.

Overall, then, the aggression machine measures gave little or no evidence of reflecting the same variables as do aggressiveness ratings by self or others; and, in this sample, self-ratings and ratings by leaders did not agree with peer ratings.

Aggressiveness and Performance

Performance on the paired-associates task was not related to any of the measures of aggressiveness except for the ratings by the gang leaders ($p < .05$). In this relationship it was the subjects rated more aggressive who performed better.

GENERAL CONCLUSIONS

The four studies combined showed only weak evidence, at best, of a tendency for aggression-proneness to disrupt performance on learning tasks. However, what was clearly documented was the methodological problems confronting any effort to investigate such a phenomenon among humans.

One of these problems is primarily ethical: except under limited circumstances it is neither ethically permissible nor, often, practically feasible to test human subjects under clear stress conditions. The aggression-performance relationship may obtain among humans but be specific to such conditions; and these studies permit no conclusions regarding this possibility.

The other two problems are (1) the definition and measurement of aggression-proneness and (2) the definition and measurement of "performance on a learning task."

It was anticipated at the outset that, as suggested by Mischel (1968), Endler and Hunt (1968), Stephens (1970), and others, individual differences in aggressive behavior may be highly specific to situation and to specific subclass of aggressive responses, so that it is simply not appropriate to speak of some subjects as being more or less aggression-prone than others. These four studies actually provided more optimistic data in this regard than was expected. In Study I, teachers agreed with one another and (given consideration of an apparent artifact in the peer-rating measure) with the children as to which children were "more aggressive". In Study II and in one of the two groups tested in Study III, peer-ratings agreed moderately well with self-ratings (and, in Study II, with coaches' ratings); and peer-ratings consistently indicated that four of the five "aggressive" behaviors rated were fairly highly intercorrelated (at least in the perception of peers). Even in Study IV, the two "peer" groups' ratings agreed significantly with one another. However, the attempt to establish the "aggression machine" as a monitoring, behavioral measure of aggression-proneness, reflecting the same variable as measured by the ratings, failed; and in Study V, the self-ratings and leaders' ratings failed to correlate with peer ratings. In summary, it appears that peer-ratings of aggression-proneness may be reliable and valid, in most populations at least, and assess differences in aggression-proneness which may be generalized enough to permit further study. However, the validity even of peer ratings is sufficiently uncertain that subsequent research must reassess the validity of such measures with each new population employed.

Only the mirror-tracing task showed a tendency to reflect an aggression-performance relationship. Elapsed time on the mirror tracing task was consistently but nonsignificantly related to peer ratings of aggressiveness and to the aggression-modelling manipulation in Study I. The error measure on the mirror tracing task did not show even this much consistency; and the labyrinth task showed essentially no relationship to any of the aggression measures in Studies II and III. The paired-associates learning task in Study IV also failed to show the expected relationship.

It is apparent that, at best, aggression-proneness may ultimately be found to disrupt some aspects of performance on some kinds of tasks (and, perhaps, even then only in some situations — e.g., stress conditions). No more general relationship than that seems likely to be found.

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